



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 21

[Docket No. FAA-2018-0379]

Airworthiness Criteria: Special Class Airworthiness Criteria for the Yamaha Fazer R

AGENCY: Federal Aviation Administration (FAA), DOT

ACTION: Notice of issuance of airworthiness criteria.

SUMMARY: The FAA announces airworthiness criteria for a special class of aircraft, the Yamaha Motor Corporation, U.S.A., model Fazer R, which is an unmanned aircraft system.. It designates airworthiness criteria found by the FAA to provide an equivalent level of safety to existing standards.

DATES: These airworthiness design criteria are effective [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION].

FOR FURTHER INFORMATION CONTACT: Mr. Quentin Coon, AIR-692, Federal Aviation Administration, Policy and Innovation Division, Small Airplane Standards Branch, Aircraft Certification Service, 901 Locust, Room 301, Kansas City, MO 64106, telephone (816) 329-4168, facsimile (816) 329-4090.

SUPPLEMENTARY INFORMATION:

Background

Yamaha Motor Corporation, U.S.A. (Yamaha) applied to the FAA on April 28, 2017 for special class type certification under Title 14, Code of Federal Regulations (14 CFR) 21.17(b) for the Fazer R Unmanned Aircraft System (UAS). The Fazer R UAS (Fazer R) consists of the

Unmanned Aircraft (UA), flight transmitter ground control station, and payload spray system.

The Fazer R is a vertical take-off UAS that is of the traditional main/tail rotor helicopter design.

Its intended primary use is conducting crop-spraying operations in the agricultural industry.

The aircraft and payload spray system would weigh approximately 244 pounds with full fuel and oil tanks, and be able to carry a payload of approximately 105 pounds. The main rotor is just over nine feet in diameter, and the aircraft would be just over three feet high and 12 feet long with a carbon frame. The aircraft would be powered by a fuel-injected 2-cylinder engine running on regular gasoline. The aircraft would have a “Turn Assistance” function that enables automatic turning to facilitate back-and-forth agricultural operations.

Discussion of Comments

Notice of proposed airworthiness design criteria for the Yamaha Fazer R UAS was published in the Federal Register on May 1, 2018 (83 FR 19021). The FAA received comments from two commenters.

One individual requested the FAA consider limiting operations to remotely populated areas and requiring primary operations of spraying, sensing, and imaging and two persons for operation. The commenter stated these considerations are necessary because of the agricultural requirements for the aircraft. The commenter also stated these requirements should be the minimum requirements for all UAS, and not only the Fazer R.

Under the Concept of Operations submitted by the applicant for the Fazer R, the primary operations are agricultural spraying, sensing, and imaging in remote, uninhabited areas such as farms and fields, and the aircraft has a required minimum crew of two persons. No changes to these airworthiness criteria are necessary as a result of this comment. The request to apply these requirements to all UAS is beyond the scope of this notice.

Another individual requested the FAA consider the possible risks—fuel and security of the system—associated with the insecticide carried by the Fazer R.

The applicant's documentation identifies and provides appropriate mitigation for these risks. No changes to these airworthiness criteria are necessary as a result of this comment.

Conclusion

After review of the comments, the FAA sees no need to modify the proposed airworthiness criteria. Accordingly, the airworthiness criteria, as proposed, are adopted as the certification basis for the Yamaha Fazer R under the provisions of 14 CFR 21.17(b).

The Airworthiness Design Criteria

The FAA finds that compliance with the following will appropriately mitigate the risks associated with the proposed design and Concept of Operations (CONOPS) and provide an equivalent level of safety to existing rules:

Concept of Operations: The applicant must define and submit to the FAA a (CONOPS) proposal describing the intended Fazer R operation in the National Airspace System (NAS).

Accepted Means of Compliance:

1. The applicant must comply with these airworthiness criteria using a means of compliance, which may include consensus standards, accepted by the FAA.
2. The applicant requesting acceptance of a means of compliance must provide the means of compliance to the FAA in a form and manner acceptable to the FAA.

Operational Envelope and Limitations: The operational envelope and operational limitations must be defined as follows:

1. The Fazer R must be shown to perform as intended within the defined operational envelope and operational limitations.

2. The Fazer R must be consistently and predictably controllable and maneuverable within the operating envelope, including:

- a) At all loading conditions for which certification is requested;
- b) During all phases of flight; and
- c) During configuration changes.

Instructions for Continued Airworthiness: The applicant must prepare Instructions for Continued Airworthiness (ICA) for the Fazer R that are acceptable to the FAA. The ICA may be incomplete at type certification if a program exists to ensure their completion prior to delivery of the first Fazer R or issuance of a standard certificate of airworthiness, whichever occurs later.

The ICA must contain a section titled Airworthiness Limitations that is segregated and clearly distinguishable from the rest of the document. This section must set forth each mandatory replacement time, structural inspection interval, and related structural inspection procedure required for type certification. If the ICA consist of multiple documents, the section required by this paragraph must be included in the principal manual. This section must contain a legible statement in a prominent location that reads “The Airworthiness Limitations section is FAA approved and specifies maintenance conducted under §§ 43.16 and 91.403 of Title 14 of the Code of Federal Regulations unless an alternative program has been FAA approved.”

Flight Manual: The applicant must provide a UAS Flight Manual with each Fazer R. The UAS Flight Manual must contain the following information—

- a) Fazer R operating limitations;

- b) Fazer R normal and emergency operating procedures;
- c) Performance information;
- d) Loading information; and
- e) Other information that is necessary for safe operation because of design, operating, or handling characteristics.

Flight Testing: The Fazer R must successfully complete at least 150 hours of flight testing to determine whether there is reasonable assurance that the Fazer R, its components, its equipment, and structures are adequate, reliable, and function properly. The testing must consist of:

1. At least 50 hours with the Unmanned Aircraft (UA) at 5 percent over maximum weight at critical weight, altitude, and temperature; and
2. At least 100 hours in normal operations.

Critical Parts: A critical part is a part, the failure of which could have a catastrophic effect upon the UAS. If the type design includes critical parts, a critical parts list must be established.

The applicant must develop and define inspections or other procedures to prevent failures due to degradation of critical parts. Each of these inspections or procedures must be included in the Airworthiness Limitations Section of the ICA.

Controls:

1. **Flight Controls:** The applicant must design the flight control systems and control station to:

- a) Operate easily, smoothly, and positively enough to allow proper performance of their functions, and
- b) Protect against likely hazards.

2. **Flight Crew Interface:** The control station must be designed to allow the flight crew to perform their duties and to perform any maneuvers within the operating envelope of the Fazer R, without excessive concentration, skill, alertness, or fatigue considering the intended operating conditions for the control station.

3. **Equipment:** The applicant must define and install necessary equipment so the flight crew can monitor and perform defined tasks associated with the intended functions of the systems and equipment.

4. **Flight Crew Error:** The UAS must be designed to minimize flight crew errors which could result in additional hazards.

Flight Termination System:

1. There must be a means for the flight crew to quickly and safely terminate the UA flight.

2. The Fazer R must have a means to safely terminate the UA flight when safe operation cannot continue or be maintained.

3. There must be means to prevent inadvertent operation of the flight termination system.

Engine and Engine Control System:

1. The Fazer R Engine and Engine Control System includes each component necessary for propulsion or which affects propulsion safety.

2. The Fazer R Engine and Engine Control System installation must be designed, constructed, installed, and maintained to ensure its continued safe operation within the operational envelope between normal inspections and overhauls.

3. The Fazer R Engine Control System including any Engine Control Unit (ECU) software or electronic hardware must be designed and developed using methods accepted by the FAA.

4. The applicant must identify the Fazer R Engine and Engine Control System failure modes and effects that may result in a catastrophic condition to the UAS. The applicant must mitigate each hazard to a level acceptable to the FAA.

5. The Fazer R Engine and Engine Control System operability, durability and reliability must be demonstrated.

Powerplant Installation:

1. The powerplant installation includes each part of the Fazer R (other than the main and auxiliary rotor structures) that—

- a) Is necessary for propulsion;
- b) Affects the control of the major propulsive units; or
- c) Affects the safety of the major propulsive units between normal inspections or overhauls.

2. Each component of the powerplant installation must be constructed, arranged, and installed to ensure its continued safe operation between normal inspections or overhauls for the range of temperature and altitude for which approval is requested.

Systems and Equipment: This requirement applies to the Fazer R unless another requirement has been imposed for a specific piece of equipment, system, or systems. The Fazer R systems and equipment, including any software or electronic hardware, must be designed and developed using methods accepted by the FAA.

1. The systems and equipment required for a Fazer R to operate safely in the kinds of operations for which certification is requested must be designed and installed to perform their intended function throughout the operating and environmental limits for which the Fazer R is certificated.

2. All systems and equipment not covered by paragraph 1 of this section, considered separately and in relation to other systems, must be designed and installed so their operation or failure does not have an adverse effect on the Fazer R.

Communication:

1. The applicant must define the type, methods, and operational limits of communication, including the mitigation of any hazard created by any loss of communication between the flight crew and between the flight crew and the Fazer R.

2. A means must be provided to allow for all communication necessary to safely operate the UA.

Interference from External Sources: The design must minimize the risks associated with interference to Fazer R electronic systems and networks from external sources.

Interference with Other Aircraft or Obstacles: The Fazer R must have a means to remain well clear of obstacles and other aircraft for its intended operation and airspace to avoid the risk of collision.

Issued in Kansas City, Missouri on April 19, 2019.

Pat Mullen
Aircraft Certification Service
Manager, Small Airplane Standards Branch, AIR-690
[FR Doc. 2019-08606 Filed: 4/26/2019 8:45 am; Publication Date: 4/29/2019]